Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

EXPERIENCE WITH AN OUTBREAK OF GRASSHOPPERS ON OVERFLOWED LAND IN LOUISIANA.

E. S. TUCKER.

UNDER date of May 28, 1913, a planter of Oscar post office, Pointe Coupee parish, Louisiana, reported that great numbers of grasshoppers had appeared on his farm and other lands in his vicinity which had been overflowed by the Mississippi flood which had come through the Torras crevasse in the previous year. For several weeks past he had noticed the insects steadily developing in size, having been very small at first, but at the time of writing many had acquired wings. Although the adults, in company with the partially or nearly grown forms, still devoted themselves chiefly to weeds, yet some of both the mature and the young hoppers were invading the cultivated fields to such an extent as to threaten the crops by their attacks.

So numerous had they become in waste places that on being disturbed by the approach of a person their jumping out of the way shook the weeds and produced a sound like the patter of falling rain. Considering their menace, he wanted to know what means he should employ to check them from further attacks on his young corn. Another party, who telephoned from near the same locality on the 29th, stated that himself and the planters around him were alarmed by the hordes of grasshoppers which had damaged cotton as well as corn, though occurring only on land that had been covered by the flood of the year before.

In reply, instructions were given for preparing and placing poisoned bran as a bait and applying poison on weeds and cultivated plants, which practices have proved successful in other states. The directions were as follows:

> To poison grasshoppers, make and use a bait composed of bran, 40 pounds; arsenic or Paris green, 3 to 5 pounds; molasses or cheap syrup, 2 gallons; water, about 2 gallons. Mix well and apply in rows along the line of advance, preferably along the fences where the insects congregate. Strew in a continuous row or in handfuls every few feet. Grasshoppers seldom feed after partaking of this mixture, but they may not die so as to be noticed much less than two or three days later. Poison may be dusted on the weeds where the insects are thick, but it should not be applied at full strength on corn or other growing crops, as it will burn the plants. Be careful of stock and poultry.

On June 7 following, the first party wrote that he had failed to get any effective results from the methods as recommended, and he requested that a personal inspection be made. He emphasized his appeal by stating that his section of country was in no shape to stand any further loss of crops, and he feared that unless something could be done promptly in order to stop ravages of the grasshoppers the crops would otherwise be entirely destroyed. While stating that a large number of the insects had not reached maturity, he declared that they had already done considerable damage by completely destroying small cotton plants and injuring all young corn. Owing to the repeated plantings of his cornfields, which had been necessitated by failure of the sprouts due to infestation by the southern corn rootworm early in the season, most of the stands were still in a tender stage of growth, being late and not very high.

By appointment, with the object of rendering all possible assistance in the matter, a visit was made by the writer on the next day. On arrival by train at Oscar station on the Frisco railway a neighbor at once directed attention to the cotton fields on his plantation, situated a short distance south of the railroad. In the first field that was visited the grasshoppers were found to have invaded it in scattered numbers from the weedy bank of a shallow bayou. They had destroyed many plants and eaten away portions of the foliage on most of the remaider of the stand throughout the adjoining half of the field. Their ravages were also noticeable beyond the middle part, even extending close the oppsite edge. The loss of stand was greatest in a sunken spot where the plants had barely put out their first leaves. On account of the small size and tender nature of these leaves, the grasshoppers had completely defoliated quite a number of the sprouts, and in several instances had also gnawed the stems.

While the ratio of dead and dying sprouts was not very large in comparison with the number of living plants, yet the surviving growth showed that it could easily be killed or at least suffer a serious backset if the ravages increased, because a considerable amount of foliage had already been consumed. Nearly every plant had one or more grasshoppers resting upon it. On observing that the majority of the grasshoppers in the field were winged adults, some apprehension was felt that further additions to their ranks would be effected just as fast as the young forms attained maturity in the weeds along the bayou, where they abounded in multitudes. The destructive effects of their voracious feeding were seen on nearly all of the wild vegetation, and many of these unfleged insects had actually encroached on the cotton plants standing close to the weedy border.

Of the two different measures that were being tried out here with the object of thwarting the insects, one consisted in the scattering of poisoned bran along the outer edge of the weeds, next to the field, according to the directions that had first been advised by letter; and the other treatment proved to be nothing more than an application of plaster of Paris to the cotton plants. The idea of using the latter substance had been proposed by the owner and carried out by his instructions. Since no dead grasshoppers could be found around the heaps of poisoned bran, and neither had any of the insects been known to feed on or pay any attention to the mixture, the trial of this preparation was therefore considered to be an absolute failure. But the plants that had been dusted with plaster of Paris, this having been first applied about a week before, presented a nearly perfect condition, though a very slight coating of the plaster remained on them. Few grasshoppers were seen on plants more recently treated with the plaster, but none of them could be detected in the act of feeding.

Results seemed to show that the latter treatment had some merit by preventing attacks after the application had been made. The plaster merely appeared to deter the insects from eating the coated leaves, as no evidence of any dead or dying hoppers came to notice anywhere. Its application on just a few rows of the plants covering but a short distance into the field was not sufficient to afford a conclusive test, yet the advantage which it gave, while the poisoned bran had proved useless, had to be acknowledged. Being an admirable sticking medium, its use might have been made more practical with less quantity per plant, and with the addition of Paris green at the rate of one part to fifteen times the amount of plaster, or in the same proportion as when the poison is used with lime. Either of these mixtures can be applied with safety to field plants. Mention might be made of another benefit rendered by the use of plaster, which is its fertilizing value to the soil after it becomes deposited on the ground.

Inspection of other cotton fields bordering the bayou disclosed the fact that the ravages committed by the grasshoppers were far less severe than in the first field, the damage being mainly confined to plants standing nearest to the heavily infested weedy banks. These observations tended to modify the prospect of a very serious situation with respect to extent of injuries. Nevertheless the hordes of young hoppers occurring in the weeds were looked upon as presenting a threatening attitude of danger, owing to their liability to spread into the fields, particularly on acquiring wings. Altogether the owner claimed that he had lost from his stands of cotton enough plants to cover eight acres.

On visiting the farm of the planter who first called for assistance, whose place adjoined the town of Oscar, situated at a distance of several miles in a northeasterly direction from the station on the railroad, the grasshoppers were found to be swarming in the weeds on roadsides, along ditch banks and fences, and throughout weedy areas extending over hundreds of acres of surrounding uncultivated fields. All of the country that had been overflowed was said to be similarly infested with the hoppers, this assertion being sustained by the statements of neighboring planters who had gathered for a conference.

The conditions on this place were declared to be fairly representative of most plantations in the district. With one or two partial exceptions, none of the planters had ever before experienced such an occurrence of the insects.

The invasion of fields with growing crops was looked upon with considerable alarm, particularly as the depredations committed by the insects on corn had already caused a general ragged appearance of the leaves, as was observed in the immediate field. Cowpeas that had started to grow between the corn rows were being rapidly consumed. Many of the grains on the heads of maturing oats plants, also growing on the plantation, were found to be gnawed and ruined, and the growth of lespedeza, which had gained a good start following the oats, was being fed upon to a perceptible extent. Despite the abundance of the grasshoppers in the latter field, the pests seemed to prefer the weeds rather than the crop plants, yet the problem remained to be faced as to what amount of harm the insects might do to the lespedeza after the harvesting of the oats, when the weeds would likewise be cut. In a field of cane just a few leaves of the plants in the outer rows were observed to be attacked, and only to a slight degree.

As stated before, the planter had failed to get any effective results from the placing of poisoned bran at the edges of weedy margins of his fields, and neither had he found any dead hoppers in the weeds where he applied Paris green and lime, these materials having been mixed at the rate of one part of the former to fifteen parts of the latter.

After returning to Baton Rouge on the following day the writer advised the station director respecting the injuries and further danger of attacks due to the myriads of grasshoppers, against which the attempts to check their invasions into the cultivated fields had proved ineffective. A decision was reached to appeal by telegram to the Federal Bureau of Entomology for coöperative assistance in an effort to determine some practical means of protecting the crops from ravages by the insects. In prompt response, Mr. J. L. Webb, an agent stationed at Crowley, La., came to the vicinity, where he was joined by the writer on June 14. Under Mr. Webb's direction, just previous to joining him, a quantity of Criddle mixture had been prepared and exposed in open places along the edge of cornfields on the planter's land.

After making a tour of the fields together, we concluded that the attacks by the grasshoppers were not extensive enough to excite fear of very serious damage to the crops, since both cotton and corn generally appeared to be growing ahead in spite of depredations. Most of the surviving cotton plants which had sustained the brunt of attacks in the edge of fields on the distant plantation situated south of the railroad gave promise of putting out a leaf expansion in excess of what would likely be devoured by the hoppers that were still observed to be busily feeding on the growth, though occurring only in scattered numbers. No marked increase in the numbers of invading insects was noticeable. The plants that had been treated with plaster of Paris seemed to have escaped further damage, except in some cases where stems had been gnawed.

Although the effects of depredations on corn were quite marked throught the fields, being most severe at the edges, yet the attacks has caused little harm to the growth other than the impairment of the lower and middle blades, which even at the worst had suffered but partial loss of tissue. Since the hoppers showed scarcely any disposition to advance very high upon the stalks, the formation of tassels on the older growth was apparently safe from attacks, and so far as the silk had put out, none of the insects appeared to be attracted to it. However, in pointing out the possibility that the pests might eat the silk even should they spare the tassels, and therefore interfere with the fertilization or development of ears, their operations in such an event would result in a reduction of the yield, since ears so affected would be stunted and mature as nubbins. Yet few individuals occurred on any single plant, and practically all of the hoppers in the field appeared in the winged stage, some of which were found pairing.

Examination of the places where poison mixture had been applied afforded very little encouragement for the attempts so far undertaken to use baits. The Criddle mixture proved to be as useless as poisoned bran. However, in weeds that had been dusted about two weeks previously with Paris green and lime, at one to fifteen parts proportionately, several dead hoppers were found lying on the ground at various short distances from one another, but no appreciable difference had been effected in the abundance of the living ones which still infested the area. The finding of other dead bodies at more frequent intervals near a heap of poisoned bran in the same place indicated that a slight mortality of the hoppers had been caused by some individuals feeding on the mixture. This evidence was all that could be obtained to denote that the pests had fed on the mixture in any situation.

On the following morning applications of powdered arsenate of lead in different amounts were made on both weeds and corn with the object of determining the efficiency of this poison according to dosage. Considering the labor and cost of material, in order to do effective work in suppression of the insects, we decided that such expenditures would evidently amount to more in value than the losses which might befall the crops, and consequently no prompt means of fighting the pests to a sufficient extent could be made economical. Our departures being hastened by other pressing duties, Mr. Webb left in the afternoon for return to his station, while the writer accompanied him as far as Livonia before turning back to Baton

Rouge. At Livonia the writer learned that although plenty of the grasshoppers occurred in the locality and had attacked corn, the farmers were not alarmed about them.

The results of the last treatments made before our departure from Oscar were reported by the planter in a letter written on the 19th, in which he reviewed the whole situation, saying as repeated herewith:

Director W. R. Dodson, Experiment Station, Baton Rouge, La.:

DEAR SIR—At the request of Mr. Tucker, who recently visited this section and made some experiments in an effort to poison the grasshoppers now very prevalent and destructive here I beg to submit the following:

The first poison used was Paris green, with one part poison to fifteen of air-slacked lime. This had no effect other than to kill some of the vegetation and a very few hoppers, but not enough apparently to reduce their numbers or to drive them away from the patches to which poison had been applied. Then poisoned wheat bran was used after a formula furnished by Mr. Tucker. This had no effect whatever, as the hoppers did not eat it. Then under the direction of Mr. Tucker and Mr. Webb, of the U. S. Department of Agriculture, a mixture of horse manure, salt and Paris green was placed in the field where the hoppers were most plentiful. Like the bran mixture, it would have been fine, only the hoppers would not eat it. Then pure arsenate of lead was applied to weeds and crops in quantities ranging from normal field conditions of three to four pounds per acre to perhaps fifteen or twenty pounds and at a prohibitive cost for labor and time. Under normal field conditions the applications produced no effects whatever, but the heavy applications damaged the corn plants a little and killed very few hoppers, not enough, however, to make any appreciable decrease in their numbers.

The hoppers seemed to have hatched out in lands that were overflowed last year and which were not cultivated this year. On my farm that means only ditch and bayou and roadsides, but there are many hundreds of acres of land surrounding me that are not in cultivation and that have produced enormous numbers of hoppers. Up to now, however, they are not migrating to any great extent, but are eating along the edges of the fields near which they were hatched. The damage done to date is not great to corn, but cotton has suffered considerable damage and yesterday I noticed them eating all of the silk from the ears of corn in the rows near the ditch banks, etc. This I believe means that we will make a good shuck and cob but no grain on the ears so damaged.

I thank you and your assistants for your efforts to help us in the matter, but must say that the results so far have been only negative ones. We have learned some of the things that will not work.

THOS. H. HEWES.

Throughout all of the observations carried on by the writer, rarely was a small bird seen on the infested lands, where, with such an abundance of insects, flocks of our so-called feathered friends, if inhabiting the country at all, would naturally have been expected to congregate from miles around to feast on the grasshoppers. In reality, not even the few birds that did show themselves in the fields appeared to pay the least attention to the hoppers.

Though the efforts so far made for repression of the pests had proved to be of little avail, the facing of this situation still left hope for a resort to other measures. Considering that reoccurrences of the grasshoppers in destructive numbers might be possible during the following year or two, if not longer, unless some practical means could be applied to check any outbreak, an appeal was again referred to the Federal Bureau of Entomology, proposing the introduction of a fungus disease, providing this plan would be considered feasible. This proposition was based on the fact that the fungus under favorable conditions has attacked and killed grasshoppers in trials made of it as reported in the publication cited farther ahead. The matter, however, did not reach the attention of the chief entomologist, Dr. L. O. Howard, until July 18, when he wrote that he had requested Dr. John R. Mohler, of the Bureau of Animal Industry, to send a tube of culture of the South African fungus. Doctor Howard remarked that, "Possibly, in the moist climate of Louisiana, the fungus will be of some effect."

At the time of receiving the culture, on August 4, word had come to hand from Mr. J. L. Webb stating that the planter had recently written that his corn had not suffered greatly from the grasshoppers, which, in fact, had mostly disappeared. Yet a visit to the locality was planned for the purpose of making an immediate trial of the fungus in case enough insects would be found to justify an introduction of the disease. The manner of procedure was adopted in accordance with directions given in an article entitled "Experimental work with fungus diseases of grasshoppers," by Dr. L. O. Howard, appearing in Yearbook of the U. S. Department of Agriculture, for 1901, pp. 459-470.

After preparing the culture on the morning of August 6, and keeping it in a warm place until evening, it was then corked in a wide-mouthed bottle and carried in this way to the field on the following morning. However, no growth of the fungus had appeared on the floating corks, but its absence was thought to be due to agitation of the contents produced by carrying the mixture about. Owing to a comparative scarcity of the grasshoppers in the fields—which condition afforded an astonishing contrast with the former abundance of the insects—only a few individuals could be collected in a weedy and grassy corner of the planter's field, where a stop was first made in search of a thickly infested place in which to apply the infection. While the slight occurrence of the insects here offered a scant prospect for a successful introduction of the disease, the captured specimens were nevertheless dipped in the infected solution and then released.

On driving farther into the back fields and finally reaching a weedy area adjoining the bank of a bayou, where the grasshoppers had formerly abounded in the most teeming swarms, a considerable number of adults were found remaining there. Being fairly numerous enough to offer a good chance for the spread of disease among them, several dozen of the insects, belonging to different species, just as they occurred, were caught, dipped in the infection, and released in a course surrounding the rankest and most heavily infested vegetation.

Why the pests had become so reduced in numbers could not be definitely explained, but the supposition may be ventured that they had normally fulfilled the functions of life shortly after attaining maturity, and then perished, leaving their deposits of eggs to hatch out into new broods during the succeeding spring. The planter stated that the reduction in numbers began soon after the time of the writer's last visit in June, and since then the hosts had steadily diminished. He also remarked that if the fungus had been applied at about the time when the hoppers became less numerous, one might easily have believed that the disease had caused them to die and disappear.

General observations made on this visit in regard to the condition of crops showed that no additional damage had been done by the grasshoppers beyond what had resulted from their earlier attacks as previously mentioned. While much silk had been eaten off from the ears of corn, no appreciable stunting or lack of development of the latter had yet come to notice. Although all of the growth was still green and had many ears with fresh silk, the grasshoppers had completely deserted the fields and could be found only in the weeds outside. A great shortage of cowpea growth, however, proved to be a matter of the most concern. Early planted cowpeas had suffered severely from the inroads of the grasshoppers, nearly all vines having been destroyed over a wide distance along the edges of the field. A later planting of the same kind in another field of corn had been almost entirely devoured on the appearance of the first leaves. The lespedeza had escaped material harm, and all the cotton that was seen in the vicinity presented no sign of molestation by grasshoppers.

In an interview with another planter at Mix post office, he said that the early ravages of the grasshoppers had caused the loss of fifty acres of cotton and about the same acreage in cowpeas, but otherwise his crops had grown right ahead and now promised good yields. At the present time not very many of the insects remained on his lands. He recalled a similar occurrence of the pests following a flood of several years before.

Regarding the use of the fungus, however, the results turned out disappointingly. The weather directly following the first introduction made by the writer, on August 7, was occasionally rainy, but the latter part of the month brought a dry spell. The planter was requested to report on the outcome, and kindly did so on August 28, writing as follows:

> "I kept the culture you left with me for a day or two until it developed the mold which you predicted would appear on the corks. I then took it to the fields and applied it to a number of grasshoppers, being careful to select some of each kind. As you know, the grasshoppers are very scarce and tests made under such circumstances are unreliable. I have made since that time serveral searches and found no dead specimens. There are now very few live ones. I regret being unable to give you more definite information. I have also searched the places where you applied the culture and found no dead hoppers."

For the purpose of correcting a certain misunderstanding, an explanation should be included here. Through a news correspondent, a wrong impression was unfortunately circulated concerning the use of plaster of Paris on cotton plants. This misrepresentation led to the following inquiry being made by the agriculturist of a large southern railway system. Only the essential parts are quoted, with modifications.

> LITTLE ROCK, ARK., June 21, 1913.
>
> I have seen an item in a New Orleans paper stating that a party of Oscar, La., has been successful in destroying grasshoppers and boll weevils with plaster of Paris. It is also stated that the effect of this substance was superior to that accomplished by a preparation advised by the State Agricultural Department in destroying grasshoppers. Do you know anything of these demonstrations, especially if this substance

has shown any merit as a destructive agent against the boll weevil? Personally I cannot see how anything could be accomplished with it, but thought possibly I might be mistaken in my conclusions. Any information you can give me regarding the matter will be appreciated.

Answer was made to the above that observations on the use of plaster of Paris for protecting cotton from grasshoppers were not sufficient to be conclusive. Boll weevils did not come under consideration at all since none were seen in the fields owing to the land having been overflowed during the year previous. The actual facts in the case were given in order to make the matter clear, emphasizing the point that the problem of suppressing the grasshoppers was not yet solved.

The prevailing species in the outbreak proved to be the common redlegged grasshopper, *Melanoplus femur-rubrum* DeG. When first observed, on June 8, this insect occurred chiefly in the unfledged stages. The youngest form had then attained to a growth seldom measuring less than one-half inch; the nymphal stage varied from five-eigths to seven-eigths inch in length. The adult males averaged about three-fourths inch in length of body, or one inch to tip of wings, and the mature females slightly exceeded the males in length. Great numbers of the insects had reached the adult stage on June 14.

The short-winged species, *Paroxya hoosieri* Blatch., was rather commonly associated with the red-legged grasshopper, appearing as nymphs on June 8 and as adults on June 14. These two species were identified by Mr. A. N. Caudell from a collection submitted by Mr. J. L. Webb.

Specimens of *Chortophaga viridifasciata* DeG. in adult form were occasionally found on June 14 and August 7. Also, examples of the following katydids were seen to be scatteringly dispersed among grasshoppers: *Scudderia furcata* Brunn., adults taken June 8; and *Conocephalus fasciatus* DeG., both nymphs and adults on same date. These determinations were furnished later by Mr. A. N. Caudell.

AGRICULTURAL EXPERIMENT STATION, BATON ROUGE.